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Wed-Mo-Or11-02 [Invited]: Magnetic field measurements of stack of double-pancake coils wound with striated and copper-plated coated conductors

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Striation is one of the approaches to reduce the shielding-current-induced fields (SCIFs) in magnets wound with coated conductors. We focus striated and copper-plated coated conductors, in which the current sharing between filaments through plated copper could improve their stability and could help their quench protection. It should be noted that the striation is effective to reduce SCIF only after the decay of coupling current which flows among filaments through plated copper.

We measured the magnetic field of stack of double-pancake coils wound with striated and copper-plated coated conductors in order to clarify the effect of striation to reduce SCIF. Four double-pancake coils were stacked, were installed in a cryostat, and were conduction-cooled by using a GM cryocooler. Each double-pancake coil was wound with 12.5 m-long conductor. The temperature of double-pancake coils was monitored and was controlled by using resistive heaters. We used a stable current supply, whose current stability is better than 10 ppm per hour, in order to examine the small field change caused by the decay of coupling current. At first, we ramped up the current to 50 A at 40 K, and the magnetic field was measured at the center of the stack of the double-pancake coils. The measured magnetic field was expanded with exponential terms with a couple of time constants. The determined time constants were compared with the decay time constant of coupling current, which was estimated from experiments using stacks of short samples of the striated coated conductor. One of the exponential terms, whose time constant was about 500 s, could represent the decay of coupling current flowing through the plated copper. The influence of the magnitude of current as well as the temperature, which could influence the resistivity of plated copper, will be studied at the second step of experiments. Furthermore, we plan the experiments using double-pancake coils with another conductor length.

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